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Source: *The Journal of Business of the University of Chicago*, Vol. 16, No. 4 (Oct., 1943), pp. 247-252

Published by: [The University of Chicago Press](#)

Stable URL: <http://www.jstor.org/stable/2350164>

Accessed: 20/06/2014 22:35

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THE STORY OF THE NITROGEN PROCESS IN FRANCE: AN EXPERIMENT IN POST-WAR PLANNING¹

H. E. FRIEDLAENDER²

IT WAS in July, 1919—two weeks after the Treaty of Versailles had been signed—that M. Loucheur, versatile minister of the liberated areas, was sitting at the conference table with the big fellows of the French chemical industry. It was a well-selected group. They all knew one another, and M. Loucheur himself had been an industrial leader before he was called for government service, first as chief of munitions, then as minister of armaments, and now as head of this new ministry that was bound to be a tough job. Sitting with the minister were M. le colonel Patart, director of the Government Powder Service, and the general manager of the Saint-Gobain corporation, the origins of which could be traced back to the times of Louis XIV and Colbert, when it manufactured glass under a royal privilege. Present also were the heads of the Etablissements Kuhlmann and of the Belgian-French Solvay group of the Lens mines, and, lastly, there was M. George Claude, engineer, successful inventor, and head of Air Liquide.

It was not necessary to start with the usual boring summary of the agenda. The topic of the day was well known to all those present: it was the Haber-Bosch process, that famous chemical process producing "nitrogen from the air" that had enabled the Boches to ridicule the blockade for more than four

years, to overcome starvation, and to maintain production of explosives on an unprecedented scale. M. Loucheur and his neighbors remembered these terrible years well. To seize a large deposit of Chilean saltpeter that had happened to be at the port of Antwerp when war broke out, the Germans had accelerated the siege. It was likewise for the control of saltpeter transports that the Count Spee squadron had harrowed the Pacific Coast until it was finally sent to the bottom through the ingenuity of the British Navy Intelligence Service. Thus Germany was entirely cut off from nitrates. This notwithstanding, there still ensued three more years of bitterness: on the one hand, submarine warfare destroyed much of the saltpeter shipping; and, on the other hand, German production of synthetic nitrogen, based upon the Haber-Bosch process, had increased from 6,000 tons in 1913 to 106,000 tons in 1918. The invention of these two young men had brought about this miracle. It had also been a hard blow to French national pride. For more than a century it had been the genius of France that had the lead in the field of chemistry.

Now all that was over, and it seemed to be but a dream. The Boches were defeated; and ample war reparations were provided for in the peace treaty, including large quantities of synthetic nitrogen to be delivered by the Badische Anilin- und Soda-Fabrik (B.A.S.F.) on the reparations account. In addition, the Haber-Bosch patents were set free for use by French industry. M. Georges Clemenceau, the prime minister, had personally emphasized the importance of national autarchy in the field of nitrates when he addressed the liberated provinces of Alsace and Lorraine at Strasbourg.

However, M. Loucheur emphasized, with

¹ The story of the nitrogen process in France that is told here is based upon official French documents. It deserves attention as an experiment in post-war planning which, on the whole, has proved to be a failure. We ought to learn from former experiences. Here is one that reveals the intricacies of such widely discussed topics as partnership between government and business, exploitation of sequestered enemy-alien patent rights, government controlled factories, and the like.

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the general agreement of all those present, that that was not sufficient. To produce synthetic nitrogen on a large scale and on a mass-production basis called for more than a knowledge of the description of the patent rights and some additional explanation given by scientific reviews. It would need for some time the active co-operation of the technical personnel of the B.A.S.F. "It needs the *tour-de-mains*," the minister said. The representatives of the various industrial groups agreed. They had already planned the foundation of the Société d'Etudes, designed to handle the problem on a joint account. Government and industry were prepared to co-operate intimately with each other, it being the task of government, in the role of trustee, to acquire the process for a lump sum of five million gold francs. On the other hand, the B.A.S.F. was under obligation to give all assistance necessary for the putting-into-operation of a modern nitrogen plant. It happened that the government was in a position to place at the disposal of the industrial group a plant that was in every respect fit for that purpose. It was the immense plant situated near Toulouse and now occupied by the powder monopoly that had established there during the war the manufacture of both powder and cyanamide. It was for this reason that M. le colonel Patart, the director of the powder administration, was present and glad to give any information requested.

Once again the minister ascertained that there was general agreement between government and industry—a good augury for a new era of co-operation. And, as a matter of fact, only a few months later a comprehensive contract was signed by the French government and the German corporation. The date chosen for the signature was November 11, 1919, precisely one year after the Armistice had put an end to the bloodshed. Co-operation between government and industry had proved to be exemplary. The government, well equipped with the weapons forged by the Treaty of Versailles, brought heavy pressure to bear upon the B.A.S.F., while the representative of the industrial group took an active part in the drafting of the contract. Imme-

diately after its signing, an official announcement was made in the *Journal officiel* inviting industrial groups to make offers for the exploitation of the process. Only a few days later, on December 8, the Société d'Etudes notified M. Loucheur that this group was intensely interested. However, as early as December 12, the group withdrew its declaration.

What had happened? It appeared that in the interval the Air Liquide group had succeeded in developing a synthetic nitrogen process of its own, based on the patents of its founder, M. George Claude. The Air Liquide had formed in combination with the Saint-Gobain group a joint subsidiary, the Grande Paroisse, with a view to exploiting through this company the Claude process, which solved the problem of synthetic nitrogen in a way different from that of the Haber-Bosch process. In addition, the Claude group started a publicity campaign, beating the national drum and protesting against governmental backing of a violation of vital French interests. Thus unity had experienced its first check.

Some time later the Solvay group withdrew. It had entered into an agreement with the American Chemical Company with a view to forming a big chemical combine, the Allied Chemical and Dye Corporation.

The next withdrawal came from the mines of Lens. This company insisted upon the exploitation of the Haber-Bosch process in a plant near to its own factory in northern France. Such a solution would have combined well with its own program, for it had received a considerable amount of war-damage certificates, available only on the basis of reconstruction within the devastated areas. On the other hand, the government continued making it a condition of the whole plan that the exploitation of the process must be conducted in the plant of the powder factory at Toulouse. The government's argument had strategic viewpoints. It emphasized the possibility—although it might be remote—of a new invasion of the northern provinces.

It was a peculiar situation. On the one hand, there was the Haber-Bosch process

that had been for years an object of the utmost envy of the whole French chemical industry, and now it was abandoned by the very groups for which the government had acquired it. Furthermore, there was a big government plant, well equipped for the manufacture of synthetic nitrogen, which had nevertheless been rejected.

Finally, the government negotiated with the powerful group of the Etablissements Kuhlmann, which was also to receive a big indemnification for war damages. This group was prepared to come to terms with the government on the basis of a sort of lease contract, called *régie intéressée*. Thus a draft bill was submitted to the chamber of deputies which authorized the government to exploit the Haber-Bosch process in that form. In the meantime several changes of cabinets had taken place. The fact was that France again needed a strong man. Thus Raymond Poincaré once more took the helm.

The Chamber of Deputies disregarded the plan of the *régie intéressée*, substituting therefor the plan of a *société mixte*. This new scheme was elaborated by the finance committee; its aim was the combining of a modern type of co-operation between government and business with two other concepts; we shall deal with them separately.

There was general mistrust within the chamber of the powerful groups of the chemical and coal industries operating in the field of by-products of coal and gas that had combined, since 1907, in the Comptoir de l'Azote. This was a strong private sales cartel that controlled the market and was in a position to keep prices on a high level, while agriculture, the main consumer of nitrates, needed low prices. Thus, there sprang into the open the idea of a government-controlled "yardstick" factory (*usine témoin*) that would be able to keep itself and the government informed of costs of production and of profit margins. It was intended to produce nitrogen on the basis of rationalized mass production and modern scientific methods already tested by the former owner of the patent rights.

This scheme was combined with another

one, that of a governmental independent factory that would keep in check the private cartel and prevent the formation of an outright fertilizer monopoly. In other words, government intended to avail itself of the advantages of the position of an outsider.

Both these ideas—that of the yardstick and that of the independent factory—sounded reasonable, particularly to the parties of the Left. The organizational problem was approached by the methods of the above-mentioned *société mixte*. In this respect, too, the finance committee followed new lines. It drafted the project of a private company whose structure would be strongly influenced by the modern concept of "functional representation" for all parties concerned, i.e., government, chemical industry, agriculture as a consumers' group, and labor. Those schemes of functional representation were widely propagated, in France no less than in England and Germany. As the result of war experiences there was general agreement about some basic ideas: there was a strong feeling that laissez faire had gone and that public intervention was necessary, at least in some industries that were vital from the viewpoint of national interests. However, what the French called *étatisme*, i.e., "mere statism," with all the implications of cumbersome bureaucracy, was likewise undesirable. As a rule, experts coming from industry, commerce, banking, and the like were asked for their advice and took part in the major decisions in a manner which was rather casual and which did not imply any real responsibility. And, finally, labor had claimed its share in the determination of wages and hours and, in some cases, even of prices and production. Thus a concept that combined public control with efficiency was achieved which would incorporate all the interested groups with one another and with government. It was those considerations that were violently discussed within the finance committee of the Chamber of Deputies and which later found its technical solution in the scheme of a *société mixte* representing an equal balance of powers.

However, as usual, ideal and practical

realization were not easily synchronized. The project of the *société mixte* provided for a stock company which was to be endowed with a capital of five hundred thousand shares of one hundred francs each.³ Provision was made in detail regarding the formation of a board of directors based upon the concept of proportional representation.

This being the project of the finance committee, the Socialist party, headed by Messrs. Léon Blum and Victor Auriol, submitted another scheme of their own, i.e., that of the Office National de l'Azote. This plan eliminated the private (mixed) company and provided for an autonomous body to be administered by a board of a somewhat different type (more labor, less government and industrial representation). This scheme of Blum and Auriol was overridden by the majority of the Chamber of Deputies but was adopted in principle (that is to say, with respect to the type of organization) by the Senate. Naturally, this conservative body altered the composition of the board of directors, eliminating entirely the labor representatives and strengthening the governmental influence up to a half (nine out of eighteen) of the total members of the board.

The debates in the Senate were full of excitement. On the one hand, M. Perrier, who reported the matter, severely censured the attitude of the private groups, which, one by one, had withdrawn from a project that they themselves had originally approved. On the other hand, a senator whose friends were among the big fellows of the chemical industry exclaimed: "Down with state monopoly! Agriculture will come out all right! *Controlleurs vous ne controlerez jamais rien!*"

Another point that was widely discussed was that of personnel. Much anxiety was felt

as to parliamentary and other influences. While it was recognized that, as regards private industry, too many board members were nothing but "papa's pets" (*filis de papa*), it was emphasized that the policy of the Office National should be to select an efficient personnel which would be "*ni un arc de triomphe, ni un dôme des invalides!*"

As for the rest, we do not intend to go into any further details. We are writing the story of the Haber-Bosch process in France and not that of the Office National de l'Azote. When the Senate finally passed the bill in midsummer, 1924, big events had happened in the meantime. In January, 1923, the Ruhr district was occupied by military forces. Among the items with respect to which Germany was found to be in arrears by the Reparation Commission were large quantities of synthetic nitrogen. Thereupon, forty thousand tons were removed from the plant at Oppau. Following this, the defeat of the Poincaré cabinet in the 1924 elections and the accession to power of the Herriot cabinet in May, 1924, put an end to the episode.

The Senate's passing of the bill providing for the Office National de l'Azote was accompanied by the granting of a sum of thirty million francs in government advances to the nitrogen enterprise. It was but the start of subsequent heavy drafts on the treasury. Now the moment had at last arrived when the Office National could start operations in the powder plant at Toulouse. The first board meeting took place in October, 1924. M. le général Patart was appointed general manager. Nearly five years had elapsed since the contract with B.A.S.F. had been signed. Another four years were to pass before real production started on a large scale. Everything progressed slowly. In the spring of 1925, the engineers of the B.A.S.F. arrived at Toulouse to show their French colleagues the *tours-de-mains* and the practical functioning of the process. Following this demonstration, the engineers of the Office National paid a long visit to the B.A.S.F. factory. When they came back to Toulouse in November, 1925, they submitted a detailed report.

There then followed a brief *entr'acte*—a

³ Three hundred thousand shares were to be taken by the government; fifty thousand shares were to be offered to the public; and the remaining hundred and fifty thousand shares were to be taken over by the interested parties—that is to say, twenty thousand by the syndicates and co-operatives of agriculture, twenty thousand by the various chambers of commerce, fifty thousand by the trade-unions, and no more than fifty thousand (that is, 6 per cent) by the producers of the chemical industry.

sort of satyr drama. The board of directors, suddenly discarding the Haber-Bosch process, on which so many hopes had been built, reversed its attitude and decided in favor of the Patart process, based upon the patent rights of the general manager of the Office National. The Patart process had at that time not even been tested. However, to be strictly impartial, it might be said that it was later adopted by some nitrogen factories in the north. After some time the board decided that the Haber-Bosch process should be employed, and this decision was final.

The intermediate period before production really started, i.e., 1926-29, was a very costly one. In 1926 the French Parliament voted and carried a new and larger credit. When production started, both the national and the international nitrate situation had decidedly changed. Since 1925 the Claude process had been utilized in some factories of the combined groups of the Air Liquide and of the Saint-Gobain combine. In other words, the government-controlled factory at Toulouse was not the only producer of synthetic nitrogen. Private planning instead of government planning had come to the fore.

In addition, it became apparent how closely national planning policy was dependent upon and connected with international aspects that made themselves felt on a world-wide scale. The competition between the natural product (Chilean saltpeter) and European nitrogen had reached a dangerous point. While in 1919 the ratio had been 50 (Chilean saltpeter) to 50 (nitrogen), the respective ratio in 1929 was 20:80. The Chilean producers' cartel collapsed. It had been formed after the war, and its board of directors included four (out of eighteen) members who were government delegates. The policy of the cartel had apparently been one of high prices. The Chilean government delegates had a practical veto because price decisions needed a majority of 80 per cent. However, their influence was not felt. Whether true or not, it was said that the government itself was in a way not interested in a low price level because high prices increased the yield

of the export tax, which had been, since 1880, the backbone of the state budget.

Apart from the price level there was the technical problem. The Chilean saltpeter industry had failed to rationalize in time and to substitute modern methods for the old Shank process. The American Guggenheim group stepped in with a view to obtaining control, or at least a considerable influence, in the saltpeter industry in order to bring about rationalization in two big new plants that operated on the basis of a new process.

The international market was in a complete panic. All the industries suffered from overcapacity. Dumping became the rule. The situation called for an understanding. After some unsuccessful attempts this understanding was finally reached in 1929 between the Chilean industry and the various European groups. The latter formed a cartel with headquarters at Basel. Its aims were to limit production and to take over large quantities of stocks. The German nitrogen industry had to restrict its production 40 per cent, the British 50 per cent, and the French Comptoir de l'Azote (the French private cartel) 10 per cent.

And what about the Office National? As noted above, it was determined to hold the position of an outsider; and, consequently, it refused to take its share in the restriction imposed by the international cartel. Naturally, the Comptoir de l'Azote protested. The dispute was brought before the minister of public works, who decided that the Office National, contrary to its program, must also restrict production to a considerable extent.

This, however, was not all. The Office National formally joined the private cartel, with the result that its whole production was to be sold by the cartel agency. Thus the role of the Office National as that of a counterpoise and antagonist of the private monopoly created by the Comptoir de l'Azote was terminated before it had really started. Finally, the various fertilizer interests were coordinated in the Office d'Engrais Mixtes, a body that comprised the nitrate, the phosphate, and the potash industries, represented by their respective organisms.

From that moment onward, the story of the Haber-Bosch process and the Office National has been, in general terms and apart from some details of a merely internal nature, the story of the French nitrogen industry as a whole. As a consequence of world-wide depression—particularly in agriculture—consumption of fertilizers decreased to such an extent that industrial capacity was exploited only at an average of 35 per cent. Chilean export policy was growing aggressive with dumping prices and threatened national production everywhere. The French government interfered and introduced, in May, 1931, a regime of import licenses administered by a commission composed of representatives of the government, of agricultural co-operatives, and of nitrate producers and sellers, all of them designated by the minister of agriculture. In other words, there was no room for the delegation of representatives of the various interested parties themselves.

The attitude of France regarding the international nitrate cartel (which was renewed in 1934, again in 1935, and, once more, in 1938) varied. For some time the French industry stood aside in the role of an outsider, trusting it could achieve a better result on

the basis of short-term clearing agreements with Chile. Later, it joined the international cartel.

The story we have told here is in many respects illustrative and instructive. It reveals the obstacles with which post-war planning is confronted. Some of these obstacles may be found inherent in and typical of similar experiments. A great many of the shortcomings of the Office National were due to the lack of experience and to the special frictions characteristic of French internal policy during the inter-war time. However, there remains a set of intricate problems which, in all probability, will arise after the second World War. In this respect it is worthy of note that the much-discussed *Report of the National Resources Planning Board* deals with three of the chief problems we have examined in our sketch: first, what to do with enemy-alien patent rights that are sequestered; second, how to handle surplus capacity of plants equipped with adequate modern machinery; and, third, how to organize co-operation between government and interested parties, such as industry, agriculture, and labor, on a partnership basis.